

What is claimed is:

1. A system of providing movement along an axis, the system comprising:
a beam including a body extending generally parallel to the axis between first and second ends, the beam including a plurality of arms extending from the body to respective tips spaced from the body;
a piezo-electric actuator coupled to the beam, the piezo-electric actuator vibrating the beam so as to induce in the beam a wave between the first and second ends; and
a plate being biased toward the body of the beam and engaging contiguously the respective tips of the plurality of arms.
2. The system according to claim 1, wherein the plurality of arms comprises first and second sets of arms, the first set of arms includes a respective first set of tips and the second set of arms includes a respective second set of tips; and
wherein the first and second sets of tips alternately contiguously engage the plate to move the plate along the axis.
3. The system according to claim 2, wherein the piezo-electric actuator vibrates the beam at first and second frequencies, the first frequency moving the plate in a first direction along the axis and the second frequency moving the plate in a second direction along the axis, the second direction being opposite to the first direction.
4. The system according to claim 1, wherein each of the plurality of arms extends a length between the body and the respective tip, the length and a magnitude of the wave amplifying a displacement of the piezo-electric actuator.
5. The system according to claim 1, wherein each of the respective tips moves in a sweeping action in response to the piezo-electric actuator vibrating the beam.
6. The system according to claim 1, wherein the beam has a harmonic frequency and the piezo-electric actuator vibrates the beam at the harmonic frequency.

7. The system according to claim 1, further comprising:
a biasing element pressing the plate against the beam.
8. An exhaust gas recirculation valve controlling a flow of exhaust gas from an exhaust manifold of an internal combustion engine to an intake manifold of the internal combustion engine, the exhaust gas recirculation valve comprising:
a passage through which the flow of exhaust gas occurs, the passage including a seat defining an aperture;
a pintle movable along an axis between first and second configurations with respect to the seat, in the first configuration the pintle occludes the aperture so as to prevent the flow of exhaust gas, and in the second configuration the pintle being spaced from the seat so as to permit the flow of exhaust gas;
a beam including a body extending generally parallel to the axis between first and second ends, the beam including a plurality of arms extending from the body to respective tips spaced from the body;
a piezo-electric actuator coupled to the beam, the piezo-electric actuator vibrating the beam so as to induce in the beam a wave between the first and second ends; and
a biasing element coupling the beam to the pintle.
9. The exhaust gas recirculation valve according to claim 8, wherein the biasing element presses the beam and the pintle into relative contiguous engagement.
10. The exhaust gas recirculation valve according to claim 8, wherein the piezo-electric actuator vibrates the beam at first and second frequencies, the first frequency moving the pintle toward the first configuration and the second frequency moving the pintle toward the second configuration.
11. A vibration beam comprising:
a body extending generally parallel to a first axis between first and second ends;
a plurality of arms extending from the body to respective tips spaced from the body; and

a piezo-electric actuator expanding and contracting along a second axis in response to an electric signal being supplied to the piezo-electric actuator, the piezo-electric actuator inducing in the body a wave between the first and second ends and inducing a sweeping motion of the respective tips.

12. The vibration beam according to claim 11, wherein the second axis is perpendicular to the first axis.

13. The vibration beam according to claim 11, wherein the first and second ends of the body are relatively fixed.

14. The vibration beam according to claim 13, wherein the body has a midpoint substantially half way between the first and second ends of the body.

15. The vibration beam according to claim 14, wherein the piezo-electric actuator is coupled to the body at the midpoint.

16. The vibration beam according to claim 14, wherein the piezo-electric actuator is coupled to the body at a point that is spaced a first distance from the first end and that is spaced a second distance from the midpoint, and the second distance is greater than the first distance.